MONTHLY WEATHER REVIEW.

Prof. CLEVELAND ABBE, Editor.

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INTRODUCTION.

This annual summary for 1894 is based upon data received from cooperating weather services, and from about 1,600 stations occupied by regular and voluntary observers of the Weather Bureau. The statistical tables have been prepared by the Division of Records and Meteorological Data, A. J. Henry, Acting Chief; the text and editorial work by Prof. Cleveland Abbe.

The title page and contents of the REVIEW for 1894 (Vol. XXII) are also published herewith.

GENERAL CLIMATIC CONDITIONS.

ATMOSPHERIC PRESSURE.

The mean pressure for 1894, as shown by the mercurial barometer, reduced to sea level but not to standard gravity, is shown on Chart I. The correction for the variation of gravity with latitude can easily be made by using the numerical values given for each degree of latitude on the right-hand side of the chart. The method of reduction to sea level adopted in the preparation of this chart is that which is used by the Weather Bureau in the preparation of the daily and monthly charts, and is known as Professor Hazen's method. As this differs from the method recommended by the International Meteorological Conference, the Editor has requested Professor Hazen to prepare a short explanation, which will be found on a subsequent page, and which gives the heights and reductions actually used at each station of the Weather Bureau during this year. By means of this table it becomes possible to approximately re-reduce, according to the international tables, if so desired. Approximate methods of reduction adapted to daily telegraphic reports are not necessarily the most appropriate for the reduction of monthly and annual mean pressures.

The isobars on Chart I show that the mean annual pressure has been highest during 1894 over the south Atlantic and east Gulf States, the maximum being 30.13 in Georgia; the small area of lowest pressure, 29.90, appears, as usual, at the head of the Gulf of California, and, as has been previously explained, is probably a branch from the area of low pressure over the equatorial Pacific. A small region of high pressure extends eastward over Oregon into Utah. The general arctic area of low pressure, 29.95, or less, extends along our northern boundary from British Columbia to Newfoundland.

MOVEMENTS OF CENTERS OF AREAS OF HIGH AND LOW PRESSURES DURING 1894.

The location of an area of high or low pressure is, to a limited extent, affected by the method adopted in the reduction of the barometer to sea level. The following summary, therefore, holds good, especially in connection with the method adopted by the Weather Bureau for the past six or eight years. The average velocities of movements of the centers of the areas are given by paths and by days in the individual tables of the successive MONTHLY WEATHER REVIEWS, and the monthly means are here collected together.

Month.	High areas.				Low areas.			
	No. of paths.	Hourly velocity.	No. of days.	Hourly velocity.	No. of paths.	Hourly velocity.	No. of days.	Hourly velocity.
		Miles.		*Miles.*		*Miles.*		*Miles.*
January	17	24.6	61.5	25.7	16	33.0	42.0	31.2
February	9	25.2	36.0	16.2	15	35.3	40.5	31.4
March	15	21.1	39.0	20.0	16	31.0	49.0	30.4
April	12	19.0	41.0	18.3	14	20.3	45.0	18.8
May	8	28.6	19.5	27.4	10	20.0	29.5	18.4
June	6	21.7	20.5	18.7	17	19.0	38.0	19.0
July	5	15.7	31.0	15.7	11	17.0	38.5	17.3
August	9	13.8	37.0	14.4	16	19.6	57.5	19.0
September	12	21.2	54.5	21.1	11	20.0	53.0	17.9
October	12	27.2	43.0	26.0	15	19.0	76.0	18.8
November	17	29.9	54.0	31.8	16	24.9	49.5	30.5
December	15	26.9	53.5	24.2	17	28.6	45.5	29.5
Annual total	137	274.9	490.5	259.5	174	287.7	564.0	282.2
Average	11.4	22.9	40.9	21.3	14.5	24.0	47.0	23.5

In general, the rapid movement of high and low areas during the winter months is well shown by this table.

TEMPERATURE.

The mean annual temperature is shown by the isotherms on Chart I. These temperatures relate to the surface of the ground. The individual figures are given in Table I of data for Weather Bureau stations. The lowest annual averages within the United States were: Williston, 40.4; St. Vincent, 37.7; Moorhead, 30.8; Duluth, 41.5; Burlington, 42.6; Eastport, 41.6. The highest averages were: Yuma, 71.4; Corpus Christi, 70.7; Key West, 76.7; Jupiter, 73.8.

The mean annual temperature was above the normal in New England, the middle and south Atlantic States, and generally throughout the interior of the country; it was slightly below the normal in Florida and the Gulf States, the plateau and Pacific coast regions.

The maximum temperatures are shown both by the upper figures and the full lines on Chart II; the minimum temperatures of the year are shown by the lower figures and the dotted lines on the same chart. The absolute range of temperature during the year is easily obtained by comparing the full and dotted lines on this chart. In general, maximum temperatures exceeding 100° occurred from the Mississippi Valley westward to the Rocky Mountain slope up to an altitude of 3,000 or 4,000 feet; the absolute maximum for the whole country was 113° at Yuma.

Minimum temperatures of 35° or less occurred in the eastern portion of North and South Dakota; the minimum line of freezing temperature, 32°, extended northward to the immediate coast of California and the southern point of Florida. The stations of large annual range of temperature were Northfield, 124; Sault Ste. Marie, 120; North Dakota, on the average, 136; St. Paul, 125; Des Moines, 131; Valentine, 141; Huron, 143; Pierre, 136; Miles City, 133; North Platte, 129; Idaho Falls, 124.

The small annual ranges were: Hatteras, 69; Jupiter, 67; Key West, 47; San Diego, 58; Los Angeles, 67; San Francisco, 58; Eureka, 51; Tatoosh Island, 54.

The accumulated departures of average monthly temperatures are given in Table III, and show that there was a progressive accumulation of temperature in excess of the normal in most of the meteorological districts. In other cases, such as Key West and the Gulf States, the plateau and Pacific districts, the accumulation of the early part of the year diminished or even became a deficit before its close.

PRECIPITATION.

The total annual fall of rain and melted snow for 1894 is shown on Chart III. The greatest precipitation was 114 inches at Tatoosh Island, and the least was 2.95 at Yuma, 4.24 at El Paso, and 4.35 at San Diego.

An annual rainfall above 60 inches occurred on the immediate coast of Oregon and Washington and over a small portion of the Florida Peninsula. An annual rainfall of less than 20 inches prevailed from Manitoba west to Alberta and southward to Mexico.

The accumulated departures of total monthly precipitations from the normal values are shown in Table IV, from which it appears that a deficit has prevailed, except over the northern plateau and Pacific coast districts and, in general, the deficit has been increasing from month to month throughout the year.

WIND.

The prevailing direction of the wind, namely, that which occurred most frequently, is given for each station in Table I; the annual resultant wind, deduced from observations at 8 a. m. and 8 p. m., is given in Table V. These resultants are also presented graphically on Chart I in connection with the barometric pressures to which they are intimately related.

The prevailing and resultant winds, deduced from the hourly readings of the self-registering anemometers, are given in Table VI; the explanation of the columns and the method of computation were given in the MONTHLY WEATHER REVIEW for December, 1893.

SENSIBLE TEMPERATURE.

The mean temperature of the wet-bulb thermometer at 8 a. m. and 8 p. m. is given in Table VII. This is the so-called sensible temperature and represents, approximately, that temperature to which the moisture, temperature, and wind of the atmosphere tend to reduce the temperature of the skin while the internal heat of the body and the protection offered by the clothing oppose such reduction. This is, therefore, the temperature proper to be considered in studying the relation between climate and hygiene. The wet-bulb thermometer from which this temperature is read is whirled at the rate of about ten feet per second within the light thermometer shelter that protects it from direct radiation.

MOISTURE.

The actual quantity of moisture in the air has been desired for special studies in irrigation, and is also needed in discussing the question of the density and weight of the atmosphere, the reduction to sea level, the formation of cloud, rain, and fog; this quantity depends essentially upon the dew-point, the mean value of which is given in Table I. In response to a request for information as to the total quantity of aqueous vapor in the atmosphere a memorandum was recently prepared, which is published for general information on a following page of this summary.

FOREIGN DATA.

Through the kind cooperation of the Superintendent of the Meteorological Office of the Dominion of Canada, the annual summary of data for Canadian stations is given in the following table, and is incorporated in the annual charts.

Annual summary of Canadian stations for 1894.

Station.	Reduced pressure.	Mean temperature.	Total precipitation.	Prevailing winds.
	Inches.	°	*Inches.*	
St. Johns, N. F	29.93	39.3	56.35	n.
Sydney, C. B. I	29.99	40.9	42.78	sw.
Halifax, N. S	30.02	42.4	45.32	n.
Grand Manan, N. B	30.01	42.9	35.30	w.
Yarmouth, N. S	30.02	42.8	35.20	n.
Saint Andrews, N. B	29.98	41.1	30.79	nw.
Charlottetown, P. E. I	29.98	41.0	34.96	w.
Chatham, N. B	29.98	38.1	33.03	w.
Father Point, Que	29.97	34.8	28.06	w.
Quebec, Que	30.00	38.6	42.17	w.
Montreal, Que	30.00	42.3	30.97	sw.
Rockliffe, Ont	29.98	37.9	29.82	nw.
Kingston, Ont	30.01	44.5	29.53	sw.
Toronto, Ont	30.03	45.8	29.64	w.
White River, Ont	30.01	32.7	24.14	w.
Port Stanley, Ont	30.04	46.1	30.54	w.
Saugeen, Ont	30.01	44.2	28.16	w.
Parry Sound, Ont	30.00	41.9	39.39	w.
Port Arthur, Ont	29.96	35.9	22.52	w.
Winnipeg, Man	29.96	35.2	18.12	nw.
Minnedosa, Man	29.94	33.8	15.20	w.
Qu'Appelle, Assin	29.95	34.5	12.52	s.
Medicine Hat, Assin	29.92	41.2	13.14	sw.
Swift Current, Assin	29.96	38.0	9.66	w.
Calgary, Alberta	29.91	37.2	11.71	w.
Prince Albert, Sask	29.94	31.5	9.25	nw.
Edmonton, Alberta	29.93	35.2	16.13	nw.
Battleford, Sask	29.91	33.1	13.47	se.
Spences Bridge, B. C	29.96	48.0	9.17	sw.
Hamilton, Bermuda	30.15	69.8	58.70	s.

Through the kindness of Mr. G. A. Fischer, observer at the office of the Mexican International Railroad Company at Ciudad Porfirio Diaz, Mexico, the following summary of observations at that place, elevation 7,222, is presented:

1894.	Rain.	Maximum temperature.		Minimum temperature.	
		Extreme.	Average.	Extreme.	Average.
January	0.37	83.0	69.1	26.0	54.7
February	....	88.5	68.0	28.0	43.0
March	0.10	93.0	82.0	36.5	53.9
April	0.91	98.5	88.6	53.0	67.8
May	5.46	98.0	88.9	62.5	72.1
June	0.28	99.0	90.5	66.0	75.1
July	0.06	104.0	96.6	74.5	78.1
August	6.70	103.0	92.8	70.5	76.8
September	4.70	96.5	89.3	66.5	74.3
October	0.07	93.5	85.9	43.0	66.0
November	0.01	85.0	74.9	36.0	48.9
December	0.04	81.0	69.2	25.5	47.1

The total rainfall during the last four years was as follows: 1891, 12.14; 1892, 20.12; 1893, 6.23; 1894, 18.70 inches.

Through the kindness of Capt. F. A. Chaves, Director of the Observatory at Ponta Delgada, San Miguel, Azores, we are enabled to present the summary of observations during 1894 at that place, given in Table II. The height of the barometer is 17 meters (56 feet); the pressure is reduced to sea level, but not to standard gravity, and is expressed in millimeters; the reduction to standard gravity is —0.4 mm.; the temperatures are expressed in degrees centigrade; the total rainfall and total evaporation are given in millimeters.

FREQUENCY OF THUNDERSTORMS.

The successive MONTHLY WEATHER REVIEWS have given, for each day and each State, the number of thunderstorms reported to the Bureau. In order to ascertain the relative frequency of thunderstorms it is necessary to know how many observers report all the storms, or nearly all of those that occur in their neighborhood; it is also necessary to know whether these observers count distant lightning or all storms that merely approach near their stations. It is believed that most of the observers adhere to the rule that a thunderstorm is to be recorded whenever thunder is heard even once, independent of any consideration as to the apparent severity or distance of the storm, or the occurrence of lightning, rain, hail, or wind at the station. These records, therefore, give simply the frequency of the first thunder. Occasionally successive thunderstorms may occur so near together that an observer may be in doubt as to whether a given peal of thunder belongs to one storm or the other. The fourth column of the following table gives, for each State, the approximate estimated number of stations that are believed to have reported all cases of thunder during the year; these numbers may sometimes be too large, but it does not seem possible to ascertain the number more precisely; in general, these thunderstorm observers are decidedly less numerous than the total number of meteorological observers enumerated in the successive REVIEWS.

Frequency of thunderstorms and auroras during 1894.

State.	Area.*	Stations.		Reduction factor.	Observed per station.	
		Needed.	Reporting.		Thunderstorms.	Auroras.
Alabama	5.1	128	40	3.2	8.0	0.02
Arizona	11.4	385	30	1.3	7.0	0.07
Arkansas	5.2	130	35	4.3	15.1	0.03
California	15.8	395	115	3.4	1.0	0.36
Colorado	10.4	260	75	3.4	8.8	0.67
Connecticut	0.5	12	20	0.6	12.6	2.55
Delaware	0.2	5	6	0.8	12.5	3.33
District of Columbia	0.01	0.2	2	0.5	10.5	2.50
Florida	5.9	148	30	4.9	42.2	0.00
Georgia	5.8	145	40	3.6	12.6	0.05
Idaho	8.6	215	20	10.7	6.3	1.50
Illinois	5.5	138	50	2.7	16.4	1.58
Indiana	3.4	85	35	2.4	10.0	1.97
Indian Territory	6.9	172	5	34.4	8.0	0.00
Iowa	5.5	138	75	1.8	10.7	2.40
Kansas	8.1	202	65	3.1	10.6	0.60
Kentucky	3.8	95	35	2.7	8.3	1.03
Louisiana	4.1	102	40	2.6	30.2	0.05
Maine	3.5	88	15	5.9	12.8	6.40
Maryland	1.1	28	25	1.1	16.4	1.60
Massachusetts	0.8	20	65	0.3	7.7	3.08
Michigan	5.6	140	60	2.2	10.3	2.57
Minnesota	8.4	210	60	3.4	15.4	7.25
Mississippi	4.7	118	40	3.0	15.0	0.02
Missouri	6.5	162	80	2.0	21.1	0.85
Montana	14.4	360	20	1.8	8.1	4.75
Nebraska	7.6	190	75	2.6	5.6	1.51
Nevada	11.2	280	30	9.3	8.0	1.57
New Hampshire	0.9	22	20	1.1	13.4	7.90
New Jersey	0.8	20	50	0.4	14.0	2.12
New Mexico	12.1	302	20	1.5	5.0	0.05
New York	4.7	118	60	2.0	10.9	2.60
North Carolina	5.1	128	50	2.6	19.3	0.66
North Dakota	7.5	185	30	6.2	5.9	9.77
Ohio	4.0	100	125	0.8	14.1	1.70
Oklahoma	......	....	15	.....	6.6	0.07
Oregon	9.5	238	45	5.3	4.4	1.26
Pennsylvania	4.6	115	55	2.1	19.3	1.77
Rhode Island	0.1	2	6	0.3	10.8	2.00
South Carolina	3.4	85	35	2.4	20.5	0.77
South Dakota	7.6	190	40	4.8	6.4	3.85
Tennessee	4.6	115	30	3.8	19.7	0.80
Texas	27.4	685	70	9.8	8.0	0.07
Utah	8.4	210	25	8.4	5.8	0.72
Vermont	1.0	25	12	2.1	17.7	5.17
Virginia	6.1	152	35	4.3	11.6	0.80
Washington	7.0	175	45	3.9	4.6	1.87
West Virginia	2.3	58	30	1.9	11.3	0.73
Wisconsin	5.3	132	60	2.2	12.5	5.02
Wyoming	9.8	245	10	24.2	3.9	2.10

* The areas are expressed in units of 10,000 square miles or 100 miles square.

Table VIII gives the total number of thunderstorms reported for each month and for the year. These numbers, however, as they now stand, must not be considered as indicating the relative frequency of the storms in each State. To obtain this item it is necessary to consider the area of each State as compared with the area actually covered by the observers. As distant thunder may be heard by an observer 10 or 12 miles away, it may be that each station records all the cases of thunder occurring within an area of 400 square miles, corresponding to a radius of little more than 11 miles. In order, therefore, to cover the whole of any one State we need the number of stations given in the third column of the preceding table. But the actual number of stations is only a small percentage of this total, and the numbers in the fifth column are the factors by which the recorded number of thunderstorms, for any month or year, should be multiplied in order to obtain, even approximately, the number of storms that occur in any given State. This multiplication will, of course, produce numbers much larger than those given in Table VIII. If, however, we forego the study of the total number of storms that probably occurred within each State we may get at "the relative frequency of storms per station" in each part of the country by dividing the numbers given in Table VIII by the number of stations; thus, in Alabama the average is 8 storms per station for the whole year, and the numbers expressing this annual frequency per station are given in the sixth column of the preceding table.

The difficulty attending the study of the total number of thunderstorms in any given State and the fact that such storms occur over large regions almost simultaneously have led to the consideration of the number of days on which thunderstorms are reported, and these numbers may also be adopted as indicative of the relative frequency of such storms. The data for this purpose are given in Table IX, but here again we must consider the relative areas of the respective States, and the total number of days must either be multiplied by the factor given in column 5, or divided by some function, as yet undetermined, of the number of stations.

FREQUENCY OF AURORAS.

The relative frequency of auroras may be studied from the data for each day and State in the successive MONTHLY WEATHER REVIEWS. The total number of observers faithfully reporting all auroras is undoubtedly less than the number reporting thunderstorms, but in the absence of precise data it is recommended that the numbers given in the preceding paragraph for thunderstorm observers be adopted as relative numbers in studying the aurora record. In order to ascertain the relative frequency of auroras it is necessary to consider the influence of cloudiness upon the visibility of the aurora, or in other words, we must know from some independent source of knowledge whether the aurora is near the observer, and therefore a local phenomenon, or whether it is distant, so that over a large region of country all are observing the same auroral light. In the latter case a cloudy sky must be considered as hiding what would otherwise be a visible aurora; in the former case the cloudy sky could not be considered as having any influence on the visibility of the aurora. It is very rare that auroras are recorded below the clouds, and none have ever yet been recorded as visible by observers above the clouds. It is, therefore, most proper to discuss the frequency of the aurora as though the light emanated from the cloud region, so that a cloudy sky is not to be reckoned as hiding the aurora. From this point of view also the report of each observer must be considered as bearing on a phenomenon that is as local as a thunderstorm, and the statistics of auroras must therefore be treated in the same way as those for thunder. (See page 254 for an analysis of the observations at Willets Point, N. Y.)

The auroral data given in the tables of the respective MONTHLY REVIEWS are collected in Tables X and XI of this Annual Summary. Table X gives the total number of auroras reported and Table XI the total number of days on which auroras occurred. The annual sum total given in Table X can be divided by the number, or relative number of stations, which divisors are the same as those for thunderstorms; the quotients or relative frequency of auroras per station are given in the last column of the preceding table.

REDUCTION OF BAROMETER READINGS TO SEA LEVEL.

[Prepared by request, April 4, 1895, by Prof. H. A. HAZEN.]

Table for reducing barometer readings to sea level as used during 1894.

Stations.	Height.	−30°	−20°	−10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
	Feet.													
Abilene, Tex	1,749				2.06	2.01	1.97	1.93	1.90	1.86	1.83	1.80	1.76	1.73
Albany, N. Y	85		.11	.11	.10	.10	.10	.10	.10	.09	.09	.09	.09	.09
Alpena, Mich	609	.78	.77	.75	.73	.72	.70	.69	.68	.66	.65	.64	.63	.62
Amarillo, Tex	3,691	4.38	4.30	4.22	4.14	4.06	3.99	3.92	3.85	3.79	3.72	3.66	3.60	3.55
Atlanta, Ga	1,131				1.34	1.31	1.29	1.26	1.24	1.22	1.19	1.17	1.15	1.13
Atlantic City, N. J	53			.05	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
Augusta, Ga	180				.22	.21	.21	.21	.20	.20	.19	.19	.19	.18
Baker City, Oreg	3,430		3.97	3.90	3.83	3.76	3.70	3.64	3.58	3.52	3.46	3.41	3.36	3.31
Baltimore, Md	179			.22	.22	.21	.21	.21	.20	.20	.19	.19	.19	.18
Bismarck, N. Dak	1,681	2.10	2.05	2.01	1.97	1.93	1.89	1.86	1.82	1.79	1.76	1.73	1.70	1.67
Block Island, R. I	27		.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
Boston, Mass	125		.15	.15	.15	.15	.14	.14	.14	.14	.14	.13	.13	.13
Buffalo, N. Y	690	.88	.86	.84	.83	.81	.79	.78	.76	.75	.74	.72	.71	.70
Cairo, Ill	359		.45	.45	.44	.43	.42	.41	.40	.39	.39	.38	.37	.37
Cape Henry, Va	21			.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
Charleston, S. C	52				.06	.06	.06	.06	.05	.05	.05	.05	.05	.05
Charlotte, N. C	773			.94	.92	.90	.89	.87	.85	.83	.82	.80	.79	.78
Chattanooga, Tenn	762			.93	.91	.89	.88	.86	.84	.82	.81	.79	.78	.77
Cheyenne, Wyo	6,105	7.13	6.98	6.83	6.67	6.52	6.37	6.22	6.08	5.95	5.83	5.72	5.62	5.52
Chicago, Ill	824	1.05	1.02	1.00	.98	.96	.94	.92	.91	.89	.87	.86	.84	.83
Cincinnati, Ohio	628		.79	.77	.76	.74	.73	.71	.70	.68	.67	.66	.65	.64
Cleveland, Ohio	740	.95	.93	.91	.89	.87	.85	.83	.82	.80	.79	.77	.76	.75
Columbia, Mo	789	1.01	.99	.97	.95	.93	.91	.89	.87	.86	.84	.82	.81	.80
Columbus, Ohio	824	1.05	1.02	1.00	.98	.96	.94	.92	.91	.89	.87	.86	.84	.83
Concordia, Kans	1,410	1.77	1.73	1.70	1.66	1.63	1.60	1.57	1.54	1.51	1.48	1.45	1.42	1.39
Corpus Christi, Tex	20						.02	.02	.02	.02	.02	.02	.02	.02
Davenport, Iowa	613	.78	.77	.75	.73	.72	.70	.69	.68	.66	.65	.64	.63	.62
Denver, Colo	5,287	6.19	6.07	5.95	5.83	5.71	5.60	5.49	5.38	5.28	5.18	5.08	4.98	4.88
Des Moines, Iowa	869	1.11	1.08	1.05	1.04	1.02	1.00	.98	.96	.94	.92	.91	.89	.88
Detroit, Mich	724	.92	.90	.88	.86	.85	.83	.81	.80	.78	.77	.75	.74	.73
Dodge City, Kans	2,523	3.08	3.02	2.96	2.90	2.85	2.79	2.74	2.69	2.64	2.60	2.55	2.51	2.47
Dubuque, Iowa	651	.83	.81	.80	.78	.76	.75	.73	.72	.71	.69	.68	.67	.66
Duluth, Minn	656	.85	.83	.81	.79	.78	.76	.75	.73	.72	.70	.69	.68	.67
Eastport, Me	76	.10	.10	.10	.10	.10	.09	.09	.09	.09	.09	.08	.08	.08
El Paso, Tex	3,813					4.19	4.11	4.04	3.97	3.90	3.84	3.77	3.71	3.65
Erie, Pa	714	.91	.89	.87	.85	.83	.82	.80	.79	.77	.76	.74	.73	.72
Eureka, Cal	64					.06	.06	.06	.06	.06	.06	.06	.06	.06
Fort Canby, Wash	179		.22	.22	.21	.21	.21	.20	.20	.20	.19	.19	.19	.18
Fort Smith, Ark	492				.59	.58	.57	.55	.54	.53	.52	.51	.50	.49
Fresno, Cal	338						.39	.38	.38	.37	.36	.36	.35	.35
Galveston, Tex	42						.05	.05	.04	.04	.04	.04	.04	.04
Grand Haven, Mich	628			.77	.75	.74	.72	.71	.70	.68	.67	.66	.65	.64
Green Bay, Wis	617	.80	.78	.76	.74	.73	.71	.70	.69	.67	.66	.65	.64	.63
Harrisburg, Pa	377		.48	.47	.46	.45	.44	.43	.42	.42	.41	.40	.39	.39
Hatteras, N. C	11				.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Helena, Mont	4,108	4.83	4.74	4.65	4.57	4.49	4.41	4.33	4.26	4.19	4.12	4.05	3.99	3.92
Hannibal, Mo	534	.68	.67	.65	.64	.62	.61	.60	.59	.58	.57	.56	.55	.54
Havre, Mont	2,477	3.03	2.97	2.91	2.86	2.80	2.75	2.70	2.65	2.60	2.56	2.51	2.47	2.43
Huron, S. Dak	1,310	1.65	1.62	1.58	1.55	1.52	1.49	1.46	1.43	1.41	1.38	1.36	1.33	1.31
Idaho Falls, Idaho	4,742	5.49	5.39	5.29	5.20	5.11	5.02	4.93	4.85	4.77	4.69	4.62	4.55	4.48
Independence, Cal	3,950				4.41	4.33	4.25	4.18	4.10	4.03	3.97	3.90	3.84	3.78
Indianapolis, Ind	766	.98	.96	.94	.92	.90	.89	.87	.85	.83	.82	.80	.79	.78
Jacksonville, Fla	43						.05	.05	.05	.05	.05	.05	.05	.05
Jupiter, Fla	28						.03	.03	.03	.03	.03	.03	.03	.03
Kansas City, Mo	963		1.19	1.17	1.14	1.12	1.10	1.08	1.06	1.04	1.02	1.00	.98	.96
Keokuk, Iowa	613	.78	.77	.75	.73	.72	.70	.69	.68	.66	.65	.64	.63	.62
Key West, Fla	22								.02	.02	.02	.02	.02	.02
Kittyhawk, N. C	9					.01	.01	.01	.01	.01	.01	.01	.01	.01
Knoxville, Tenn	980		1.22	1.19	1.17	1.14	1.12	1.10	1.08	1.06	1.04	1.02	1.00	.98
La Crosse, Wis	720	.92	.90	.88	.86	.85	.83	.81	.80	.78	.77	.75	.74	.73
Lander, Wyo	5,377	6.14	6.03	5.92	5.82	5.72	5.62	5.53	5.44	5.35	5.27	5.19	5.11	5.03
Little Rock, Ark	302	.39	.38	.37	.36	.36	.35	.34	.34	.33	.32	.32	.31	.30
Los Angeles, Cal	330						.38	.37	.37	.36	.35	.35	.34	.34
Louisville, Ky	525	.68	.67	.65	.64	.62	.61	.60	.59	.58	.57	.56	.55	.54
Lynchburg, Va	685				.83	.81	.79	.78	.76	.75	.74	.72	.71	.70
Marquette, Mich	734	.93	.91	.89	.87	.86	.84	.82	.81	.79	.78	.76	.75	.74
Memphis, Tenn	330				.40	.39	.38	.38	.37	.36	.36	.35	.34	.34
Meridian, Miss	358				.44	.43	.42	.41	.40	.39	.39	.38	.37	.37
Miles City, Mont	2,374	2.91	2.85	2.79	2.74	2.68	2.63	2.58	2.54	2.49	2.45	2.41	2.37	2.33
Milwaukee, Wis	673	.86	.84	.82	.80	.79	.77	.76	.74	.73	.71	.70	.69	.68
Mobile, Ala	57				.07	.07	.07	.07	.07	.07	.06	.06	.06	.06
Montgomery, Ala	257				.32	.31	.30	.30	.29	.28	.28	.27	.27	.26
Moorhead, Minn	935	1.20	1.17	1.14	1.12	1.10	1.08	1.06	1.04	1.02	1.00	.98	.96	.95
Nantucket, Mass	14				.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Nashville, Tenn	545		.69	.68	.66	.65	.64	.62	.61	.60	.59	.58	.57	.56

Table for reducing barometer readings to sea level—Continued.

Stations.	Height.	−30°	−20°	−10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
	Feet.													
New Haven, Conn	107				.13	.13	.12	.12	.12	.12	.11	.11	.11	.11
New London, Conn	45				.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
New Orleans, La	54				.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
New York, N. Y	185				.22	.22	.21	.21	.20	.20	.20	.19	.19	.19
Norfolk, Va	57				.07	.07	.07	.07	.07	.07	.06	.06	.06	.06
Northfield, Vt	872		1.08	1.06	1.04	1.02	1.00	.98	.96	.94	.92	.91	.89	.88
North Platte, Nebr	2,841	3.45	3.38	3.31	3.25	3.19	3.13	3.07	3.01	2.96	2.91	2.86	2.81	2.76
Oklahoma, Okla	1,239			1.50	1.47	1.44	1.41	1.38	1.36	1.33	1.31	1.28	1.26	1.24
Omaha, Nebr	1,123	1.42	1.39	1.36	1.33	1.30	1.28	1.25	1.23	1.21	1.18	1.16	1.14	1.12
Oswego, N. Y	335	.44	.43	.42	.41	.40	.39	.39	.38	.37	.36	.36	.35	.35
Palestine, Tex	510					.60	.59	.58	.57	.56	.55	.54	.53	.52
Parkersburg, W. Va	638	.82	.80	.78	.77	.75	.74	.72	.71	.70	.68	.67	.66	.65
Pensacola, Fla	56					.06	.06	.06	.06	.06	.06	.06	.06	.06
Philadelphia, Pa	117				.13	.13	.13	.13	.13	.12	.12	.12	.12	.12
Pierre, S. Dak	1,470	1.84	1.81	1.77	1.73	1.70	1.66	1.63	1.60	1.57	1.54	1.52	1.49	1.46
Pittsburg, Pa	842			1.02	1.00	.98	.96	.94	.93	.91	.89	.88	.86	.85
Port Angeles, Wash	29							.03	.03	.03	.03	.03	.03	.03
Port Huron, Mich	639	.82	.80	.78	.77	.75	.74	.72	.71	.70	.68	.67	.66	.65
Portland, Me	103				.11	.11	.11	.11	.11	.10	.10	.10	.10	.10
Portland, Oreg	157				.19	.19	.19	.18	.18	.18	.17	.17	.17	.16
Pueblo, Colo	4,734		5.38	5.28	5.19	5.10	5.01	4.92	4.84	4.76	4.69	4.61	4.54	4.47
Raleigh, N. C	388				.47	.46	.45	.44	.43	.43	.42	.41	.40	.40
Rapid City, S. Dak	3,280		3.83	3.76	3.69	3.62	3.56	3.49	3.43	3.37	3.32	3.26	3.21	3.15
Red Bluff, Cal	342					.40	.39	.39	.38	.37	.36	.36	.35	.35
Rochester, N. Y	323	.67	.65	.64	.63	.61	.60	.59	.58	.57	.56	.55	.54	.53
Roseburg, Oreg	523				.63	.61	.60	.59	.58	.57	.56	.55	.54	.53
Sacramento, Cal	71				.08	.08	.08	.08	.08	.08	.08	.07	.07	.07
St. Louis, Mo	571		.72	.70	.69	.67	.66	.64	.63	.62	.61	.60	.59	.58
St. Paul, Minn	850	1.08	1.06	1.04	1.02	1.00	.98	.96	.94	.92	.90	.89	.87	.86
St. Vincent, Minn	804	1.02	1.00	.98	.96	.94	.92	.90	.88	.86	.85	.84	.83	.82
Salt Lake City, Utah	4,345				4.81	4.72	4.64	4.56	4.48	4.41	4.34	4.27	4.20	4.14
San Antonio, Tex	679				.82	.80	.78	.77	.75	.74	.72	.71	.70	.69
San Diego, Cal	93				.10	.10	.10	.10	.10	.10	.10	.10	.10	.10
Sandusky, Ohio	629	.81	.79	.77	.76	.74	.73	.71	.70	.68	.67	.66	.65	.64
San Francisco, Cal	153				.18	.18	.18	.17	.17	.17	.16	.16	.16	.15
San Luis Obispo, Cal	234				.28	.27	.27	.26	.26	.25	.25	.24	.24	.23
Santa Fe, N. Mex	6,998				7.21	7.10	6.99	6.88	6.77	6.67	6.57	6.48	6.40	6.31
Sault Ste. Marie, Mich	642	.82	.80	.78	.77	.75	.74	.72	.71	.70	.68	.67	.66	.65
Savannah, Ga	98					.12	.12	.11	.11	.11	.11	.11	.10	.10
Shreveport, La	249				.30	.30	.29	.28	.28	.27	.27	.26	.26	.25
Sioux City, Iowa	1,165	1.47	1.44	1.41	1.38	1.35	1.32	1.30	1.27	1.25	1.23	1.20	1.18	1.16
Seattle, Wash	119		.15	.15	.15	.14	.14	.14	.13	.13	.13	.13	.12	.12
Spokane, Wash	1,930	2.39	2.34	2.30	2.25	2.21	2.16	2.12	2.08	2.05	2.01	1.98	1.94	1.91
Springfield, Ill	644	.82	.80	.78	.77	.75	.74	.72	.71	.70	.68	.67	.66	.65
Springfield, Mo	1,336	1.69	1.65	1.62	1.58	1.55	1.52	1.49	1.46	1.44	1.41	1.39	1.36	1.33
Tampa, Fla	36						.04	.04	.04	.04	.04	.04	.04	.04
Tatoosh Isl'd, Wash	86				.11	.11	.11	.10	.10	.10	.10	.10	.09	.09
Titusville, Fla	44						.04	.04	.04	.04	.04	.04	.04	.04
Toledo, Ohio	674	.86	.84	.82	.80	.79	.77	.76	.74	.73	.71	.70	.69	.68
Tucson, Ariz	2,390				2.76	2.71	2.66	2.61	2.56	2.51	2.47	2.43	2.39	2.35
Valentine, Nebr	2,613	3.18	3.12	3.06	3.00	2.94	2.89	2.83	2.78	2.73	2.69	2.64	2.60	2.55
Vicksburg, Miss	254				.30	.30	.29	.28	.28	.27	.27	.26	.26	.25
Walla Walla, Wash	1,018			1.26	1.23	1.20	1.17	1.14	1.12	1.10	1.08	1.06	1.03	1.01
Washington, D.C	112				.13	.13	.13	.13	.12	.12	.12	.12	.11	.11
Wichita, Kans	1,366		1.69	1.65	1.62	1.58	1.55	1.52	1.50	1.47	1.44	1.41	1.39	1.36
Williston, N. Dak	1,875	2.32	2.28	2.23	2.18	2.14	2.10	2.06	2.02	1.99	1.95	1.92	1.88	1.85
Wilmington, N. C	78				.10	.10	.09	.09	.09	.09	.09	.08	.08	.08
Winnemucca, Nev	4,340			4.84	4.76	4.68	4.60	4.52	4.44	4.37	4.30	4.24	4.18	4.12
Woods Holl, Mass	22				.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
Yuma, Ariz	141						.16	.15	.15	.15	.15	.14	.14	.14

The accompanying table gives the reduction to sea level at all the stations of the Weather Bureau, and the following explanation of the table is added. The formula which lies at the basis of all theoretical reductions of barometer readings to sea level is that of Laplace. It has been found, however, that in the case of individual observations there are serious errors introduced in the application of the formula, and these are due in part to the fact that the temperature argument—that is, the mean of the temperatures observed at the base and